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Claims

[c1] 1. A process for repairing a compressor rear frame of a gas turbine engine, the compressor rear frame comprising a cylindrically-shaped inner casing wall and a cylindrically-shaped outer casing wall that substantially circumscribes the inner casing wall, the inner casing wall having a flange adapted to carry a seal member, the process comprising the steps of:

removing the flange from the inner casing wall to define an annular face on the inner casing wall, the annular face having a width;

fabricating a replacement flange to have an annular face with a width that is greater than the width of the annular face of the inner casing wall;

mating the annular faces of the replacement flange and the inner casing wall to define a joint therebetween;

depositing a penetration-enhancing flux on adjacent surfaces of the replacement flange and the inner casing wall separated by the joint;

performing a gas tungsten arc welding operation by generating an electric arc between an electrode and the joint between the adjacent surfaces of the replacement flange and the inner casing wall, the welding operation

forming a root weldment that extends completely through the joint to metallurgically join the replacement flange to the inner casing wall;

removing substantially all of the penetration-enhancing flux that remains following the welding operation; and then

performing a single-pass gas tungsten arc welding operation to form a second weldment that does not penetrate through the root weldment.

[c2] 2. The process according to claim 1, wherein the joint between the replacement flange and the inner casing wall is a square butt joint so that a gap is not present between the annular faces of the replacement flange and the inner casing wall following the mating step.

[c3] 3. The process according to claim 1, wherein the annular faces of the replacement flange and the inner casing wall lie in a plane substantially normal to a longitudinal axis of the inner casing wall.

[c4] 4. The process according to claim 1, wherein the width of the annular face of the inner casing wall is greater than 2.3 mm.

[c5] 5. The process according to claim 1, wherein the width of the annular face of the inner casing wall is greater

than 3 mm.

[c6] 6. The process according to claim 1, wherein the width of the annular face of the replacement flange is about 50% greater than the width of the annular face of the inner casing wall.

[c7] 7. The process according to claim 1, wherein the second weldment completely covers the root weldment.

[c8] 8. The process according to claim 1, wherein the second weldment does not penetrate more than 30% through the thickness of the root weldment.

[c9] 9. The process according to claim 1, wherein during the step of performing the single-pass gas tungsten arc welding operation to form the root weldment, automatic voltage control is employed to maintain a substantially constant arc length between the electrode and the joint between the adjacent surfaces of the replacement flange and the inner casing wall.

[c10] 10. The process according to claim 1, wherein the adjacent surfaces of the replacement flange and the inner casing wall are located within an interior of the inner casing wall.

[c11] 11. The process according to claim 1, wherein the flux

contains titanates and one or more transition metal oxides.

[c12] 12. A process for repairing a compressor rear frame of a gas turbine engine, the compressor rear frame comprising a cylindrically-shaped inner casing wall and a cylindrically-shaped outer casing wall that substantially circumscribes the inner casing wall, the inner casing wall having a seal flange that projects radially inward from one end of the inner casing wall so as to be substantially normal to a longitudinal axis of the inner casing wall, the seal flange being adapted to carry a seal member, the process comprising the steps of:

cutting the inner casing wall at a location axially inward from the seal flange so as to remove from the inner casing wall the seal flange and a contiguous portion of the inner casing wall and define an annular face on the inner casing wall, the annular face having a radial width in a direction normal to the longitudinal axis of the inner casing wall;

fabricating a replacement seal flange that is similar in shape to the seal flange and the contiguous portion removed from the inner casing wall, the replacement seal flange having an annular face with a radial width that is greater than the radial width of the annular face of the inner casing wall;

mating the annular faces of the replacement seal flange and the inner casing wall to define a square butt joint therebetween whereby a gap is not present between the annular faces of the replacement seal flange and the inner casing wall following the mating step;

depositing a penetration-enhancing flux on adjacent surfaces of the replacement seal flange and the inner casing wall separated by the square butt joint of the annular faces, the adjacent surfaces being located within an interior of the inner casing wall;

performing a single-pass gas tungsten arc welding operation by generating an electric arc between an electrode and the adjacent surfaces at the square butt joint, the welding operation forming a root weldment that extends completely through the square butt joint to metallurgically joins the replacement seal flange to the inner casing wall;

removing the penetration-enhancing flux; and then

performing a single-pass gas tungsten arc welding operation to deposit a filler on the root weldment to form a second weldment that does not penetrate through the root weldment.

[c13] 13. The process according to claim 12, wherein the annular faces of the replacement seal flange and the inner casing wall lie in a plane substantially normal to the lon-

gitudinal axis of the inner casing wall.

[c14] 14. The process according to claim 12, wherein the radial width of the annular face of the inner casing wall is greater than 2.3 mm.

[c15] 15. The process according to claim 12, wherein the radial width of the annular face of the inner casing wall is greater than 3 mm.

[c16] 16. The process according to claim 12, wherein the radial width of the annular face of the replacement seal flange is about 50% greater than the radial width of the annular face of the inner casing wall.

[c17] 17. The process according to claim 12, wherein the second weldment completely covers the root weldment.

[c18] 18. The process according to claim 12, wherein the second weldment does not penetrate more than 30% through the thickness of the root weldment.

[c19] 19. The process according to claim 12, wherein during the step of performing the single-pass gas tungsten arc welding operation to form the root weldment, automatic voltage control is employed to maintain a substantially constant arc length between the electrode and the adjacent surfaces at the square butt joint.

[c20] 20. The process according to claim 12, wherein the flux contains titanates and one or more transition metal oxides.